

THE PENGUIN DICTIONARY OF  
**CHEMISTRY**

Second Edition

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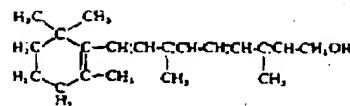
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## 422 vitamins

**vitamins** Vitamins are substances other than proteins, carbohydrates, fats and mineral salts, that are essential constituents of the food of animals. In their absence the animal develops certain deficiency diseases or other abnormal conditions. Vitamins might also be defined as substances that play an essential part in animal metabolic processes, but which the animal cannot synthesize, although certain animals can synthesize certain vitamins and all animals needing vitamin D can manufacture it from ergosterol in the presence of u.v. light. The precise mechanism of action of many vitamins is still poorly understood.

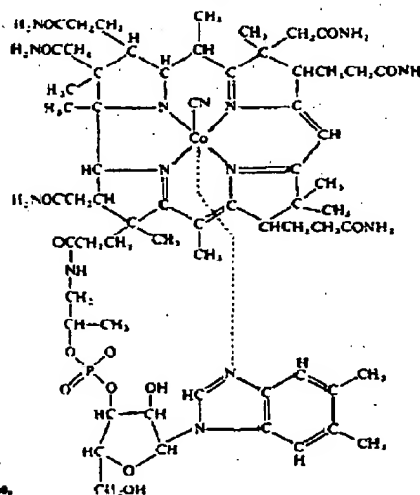
**vitamin A** Vitamin A is the original fat-soluble vitamin. Its absence from the diet leads to a loss in weight and failure of growth in young animals, to the eye diseases xerophthalmia and night blindness, and to a general susceptibility to infections. The most fundamental effect of its deficiency is a keratinization of epithelial tissues. Vitamin A is present in animal fats, butter, yolk of egg, and in particularly large quantities in fish-liver oils, especially halibut liver oil. Carotene is converted into vitamin A in the liver, hence good sources of carotene, such as green vegetables, are good potential sources of vitamin A. Vitamin A is structurally related to carotene. It has the empirical formula  $C_{20}H_{30}O$  and the structural formula



Two molecules of vitamin A are formed from one molecule of  $\beta$ -carotene. Vitamin A crystallizes in pale yellow needles; m.p.  $64^{\circ}\text{C}$ . It is optically inactive. It is unstable in solution when heated in air, but comparatively stable without aeration. Vitamin A is manufactured by extraction from fish-liver oils and by synthesis from  $\beta$ -ionone. The rôle of vitamin A in vision seems to be different from its systemic function. See also retinene and rhodopsin.

**vitamin B** The original vitamin B has been shown to consist of a number of different substances. The B vitamins include vitamin B<sub>1</sub> (thiamine), vitamin B<sub>12</sub> (cyanocobalamin), vitamin B<sub>6</sub> folic acid (pteroylglutamic acid), vitamin B<sub>5</sub> (pyridoxine), pantothenic acid and biotin.

**vitamin B<sub>12</sub>, cyanocobalamin**,  $C_{62}H_{90}CoN_{14}O_{14}P$ . Dark red crystals. Vitamin B<sub>12</sub> has been prepared synthetically. Vitamin B<sub>12</sub> is produced by the growth of certain micro-organisms, and occurs also in liver.



vitamin B<sub>12</sub>,  
cyanocobalamin.

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# DICTIONARY OF BIOCHEMISTRY AND MOLECULAR BIOLOGY

Second Edition

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## viscosity increment

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vitamin B<sub>3</sub>

that varies with the system being studied. When  $\alpha = 1$ ,  $\bar{M}_w$  becomes equal to the weight-average molecular weight ( $\bar{M}_w$ ); when  $\alpha < 1$ ,  $\bar{M}_w$  falls between the number-average ( $\bar{M}_n$ ) and the weight-average molecular weight; and when  $\alpha > 1$ ,  $\bar{M}_w$  falls between the weight-average molecular weight and the z-average molecular weight ( $\bar{M}_z$ ). *Syn*  $\bar{M}_w$ .

**viscosity increment** A measure of the asymmetry of a solute molecule that is equal to the ratio of the intrinsic viscosity of the solution to the partial specific volume of the solute.

**viscosity number** REDUCED VISCOSITY.

**viscosity ratio** RELATIVE VISCOSITY.

**viscotoxins** A group of homologous proteins, containing 46 amino acid residues and 3 disulfide bonds; the viscotoxins are plant toxins (phytotoxins) that act as hypotensive agents, slowing the rate of heart beat.

**viscous** 1. Possessing viscosity. 2. Thick; sticky; glutinous.

**viscous drag** The frictional force that counteracts and balances either the electrical driving force in electrophoresis or the centrifugal force in sedimentation.

**visible dichroism** The dichroism that is produced when visible polarized light is absorbed by oriented samples.

**visible mutation** A mutation that results in some alteration of the morphology of an organism.

**visible spectrum** That part of the electromagnetic spectrum that covers the wavelength range of about  $4 \times 10^{-5}$  to  $7.5 \times 10^{-5}$  cm and that includes photons that are emitted or absorbed during electronic transitions.

**visual cycle** A cyclic set of reactions that occur in both the rods and the cones of the retina whereby (a) light leads to the isomerization of 11-*cis*-retinal to the all-*trans*-retinal and to its dissociation from the appropriate opsin, and (b) the all-*trans* isomer is reconverted enzymatically to the 11-*cis* isomer which recombines with the opsin.

**visual pigment** One of several conjugated proteins that consist of an opsin and a form of vitamin A aldehyde and that function in the biochemical reactions that pertain to vision.

**visual purple** RHODOPSIN.

**visual threshold** The minimum light intensity required to produce a visual sensation.

**vital capacity** The greatest volume of air that can be expired after a forced inspiration; includes the tidal, supplemental, and complementary airs.

**vitalism** The doctrine that life and its phenomena are not fully explicable in terms of the laws and processes of chemistry and physics, and that they require special vital forces that are found only in living organisms. *See*

*also* mechanistic philosophy.

**vital stain** A stain that can penetrate the cell membrane of a living cell and that can stain the contents without injury to the cell.

**vitamer** One of two or more forms of a vitamin; vitamins A<sub>1</sub> and A<sub>2</sub> are examples of vitamers.

**vitamin** An organic compound that (a) occurs in natural food in extremely small concentrations and is distinct from carbohydrates, lipids, proteins, and nucleic acids; (b) is required by the organism (generally restricted to animals) in minute amounts for normal health and growth, and generally functions as a component of a coenzyme; (c) when absent from the diet, or improperly absorbed from the food, leads to the development of a specific deficiency disease; (d) cannot be synthesized by the organism and must, therefore, be obtained exclusively through the diet.

**vitamin A** A generic descriptor of all  $\beta$ -ionone derivatives, other than provitamin A carotenoids, that exhibit qualitatively the biological activity of all-*trans*-retinol. Vitamin A is a fat-soluble vitamin that is structurally related to the carotenes and that is required for certain aspects of metabolism, particularly the biochemistry of vision. Vitamin A<sub>1</sub> (retinol<sub>1</sub>) predominates in higher animals and marine fish, and vitamin A<sub>2</sub> (retinol<sub>2</sub>) predominates in freshwater fish; the two forms differ by one double bond in the molecule. A deficiency of vitamin A causes night blindness and xerophthalmia. The recommended names for vitamin A derivatives are as follows: retinol (vitamin A<sub>1</sub> alcohol; xerophthol); retinal or retinaldehyde (vitamin A<sub>1</sub> aldehyde; retinene); retinoic acid (vitamin A<sub>1</sub> acid); and 3-dehydroretinol (vitamin A<sub>2</sub>). *See also* anti-promoter.

**vitamin A<sub>1</sub>** *See* vitamin A.

**vitamin A<sub>2</sub>** *See* vitamin A.

**vitamin A<sub>1</sub> acid** *See* vitamin A.

**vitamin A<sub>1</sub> alcohol** *See* vitamin A.

**vitamin A<sub>1</sub> aldehyde** *See* vitamin A.

**vitamin B** 1. VITAMIN B COMPLEX. 2. The original antiberiberi activity.

**vitamin B<sub>1</sub>** THIAMINE.

**vitamin B<sub>2</sub>** RIBOFLAVIN.

**vitamin B<sub>3</sub>** PANTOTHENIC ACID.

**vitamin B<sub>4</sub>** An activity, isolated from yeast or liver, that could alleviate muscular weakness in rats and chicks. The existence of vitamin B<sub>4</sub> has not been confirmed since all purported vitamin B<sub>4</sub> deficiency symptoms could be alleviated by known nutritional factors such as thiamine, glycine, arginine, and cystine.

**vitamin B<sub>5</sub>** A growth-stimulating activity in pigeons that is probably identical with nicotinic acid.